

**WHAT IS CLAIMED IS:**

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2           1.     A blend comprising:  
3                 a first PHA, and  
4                 a second PHA, the second PHA being different from the first PHA and  
5                 blended with the first PHA;  
6                 wherein an amount of the first PHA in the blend is greater than an amount of  
7                 the second PHA in the blend, a stiffness of the blend is less than a stiffness of the first  
8                 PHA, and when the first PHA and the second PHA are blended, and the blend is  
9                 molded, the blend has a deformation angle tolerance of at least about 5°.  
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11           2.     The blend of claim 1, wherein the blend has a deformation angle tolerance of  
12           at least about 15°.  
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14           3.     The blend of claim 1, wherein the blend has a deformation angle tolerance of  
15           at least about 30°.  
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17           4.     The blend of claim 1, wherein the blend has a deformation angle tolerance of  
18           at least about 60°.  
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20           5.     The blend of claim 1, wherein the blend has a deformation angle tolerance of  
21           at least about 90°.  
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23           6.     The blend of claim 1, wherein the blend has a deformation angle tolerance of  
24           at least about 120°.  
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26           7.     The blend of claim 1, wherein the blend has a stiffness of at most about 250  
27           Mpa.  
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29           8.     The blend of claim 1, wherein the first PHA and the second PHA are both  
30           homopolymers.

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32           9.     The blend of claim 1, wherein the first PHA is a homopolymer and the second  
33 PHA is a copolymer having a first comonomer and a second comonomer, the first  
34 comonomer being different from the second comonomer.

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36           10.    The blend of claim 9, wherein the homopolymer is poly(3-hydroxybutyrate).

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38           11.    The blend of claim 10, wherein the first comonomer is 3-hydroxybutyrate.

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40           12.    The blend of claim 11, wherein the second comonomer is selected from 4-  
41 hydroxybutyrate, 3-hydroxypropionate, 4-hydroxyvalerate, 6-hydroxyhexanoate, 3-  
42 hydroxyhexanoate, 3-hydroxyoctanoate, 3-hydroxydecanoate, 3-hydroxydodecanoate, or 3-  
43 hydroxydodecenoate.

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45           13.    The blend of claim 1, wherein the first PHA is a copolymer having a  
46 comonomer 1-A and a comonomer 1-B and the second PHA is a copolymer having a  
47 comonomer 2-A and a comonomer 2-B.

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49           14.    The blend of claim 13, wherein comonomer 1-A and comonomer 2-A are the  
50 same comonomer.

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52           15.    The blend of claim 14, wherein comonomer 1-A and comonomer 2-A are both  
53 3-hydroxybutyrate.

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55           16.    The blend of claim 15, wherein each of comonomer 1-B and comonomer 2-B  
56 is, independently, 3-hydroxyvalerate, 4-hydroxybutyrate, 3-hydroxyhexanoate, 3-  
57 hydroxyoctanoate, 3-hydroxypropionate, 4-hydroxyvalerate, 6-hydroxyhexanoate, 3-  
58 hydroxydecanoate, 3-hydroxydodecanoate, or 3-hydroxydodecenoate.

60           17.     The blend of claim 13, wherein the first PHA copolymer and the second PHA  
61 copolymer are the same copolymer, wherein the ratio of comonomer 1-A:comonomer 1-B is  
62 different from the ratio of comonomer 2-A:comonomer 2-B.

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64           18.     The blend of claim 17, wherein comonomer 1-A and comonomer 2-A are both  
65 3-hydroxybutyrate.

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67           19.     The blend of claim 18, wherein comonomer 1-B and comonomer 2-B are both  
68 4-hydroxybutyrate, 3-hydroxyhexanoate, or 3-hydroxyoctanoate, 3-hydroxypropionate, 6-  
69 hydroxyhexanoate, 3-hydroxydecanoate, 3-hydroxydodecanoate, or 3-hydroxydodecenoate.

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71           20.     The blend of claim 15, wherein the first PHA copolymer contains at most  
72 about 99 percent by weight of comonomer 1-B.

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74           21.     The blend of claim 15, wherein the first PHA copolymer contains at most  
75 about 50 percent by weight of comonomer 1-B.

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77           22.     The blend of claim 15, wherein the first PHA copolymer contains at most  
78 about 15 percent by weight of comonomer 1-B.

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80           23.     The blend of claim 15, wherein the first PHA copolymer contains at most  
81 about 7 percent by weight of comonomer 1-B.

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83           24.     The blend of claim 15, wherein the first PHA copolymer contains at most  
84 about 1 percent by weight of comonomer 1-B.

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86           25.     The blend of claim 15, wherein the second PHA copolymer contains at most  
87 about 99 percent by weight of comonomer 2-B.

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89           26.     The blend of claim 15, wherein the second PHA copolymer contains at most  
90 about 50 percent by weight of comonomer 2-B.

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92           27.     The blend of claim 15, wherein the second PHA copolymer contains at most  
93 about 35 percent by weight of comonomer 2-B.

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95           28.     The blend of claim 15, wherein the second PHA copolymer contains at most  
96 about 15 percent by weight of comonomer 2-B.

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98           29.     The blend of claim 15, wherein the second PHA copolymer contains at most  
99 about 5 percent by weight of comonomer 2-B.

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101           30.     The blend of claim 1, wherein the blend comprises at least about 90 % by  
102 weight of the first PHA.

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104           31.     The blend of claim 1, wherein the blend comprises at least about 70 % by  
105 weight of the first PHA.

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107           32.     The blend of claim 1, wherein the blend comprises at least about 51 % by  
108 weight of the first PHA.

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110           33.     The blend of claim 30, wherein the blend comprises at most about 49 % by  
111 weight of the second PHA.

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113           34.     The blend of claim 30, wherein the blend comprises at most about 30 % by  
114 weight of the second PHA.

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116           35.     The blend of claim 30, wherein the blend comprises at most about 10 % by  
117 weight of the second PHA.

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119           36.     The blend of claim 1, wherein the first PHA has a first molecular weight and  
120 the second PHA has a second molecular weight, wherein the first molecular weight is from

121 about 10,000 Daltons to about 1,600,000 Daltons and second molecular weight is from about  
122 10,000 Daltons to about 1,600,000 Daltons.

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124 37. The blend of claim 36, wherein the first molecular weight is from about  
125 200,000 Daltons to about 650,000 Daltons and second molecular weight is from about  
126 200,000 Daltons to about 650,000 Daltons.

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128 38. The blend of claim 36, wherein one PHA has a molecular weight that is at  
129 most about 200,000 Daltons, and the other PHA has molecular weight that is at most about  
130 1,000,000 Daltons.

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132 39. The blend of claim 36, wherein the first molecular weight is at most about  
133 750,000 Daltons and second molecular weight are both at most about 750,000 Daltons.

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135 40. The blend of claim 36, wherein one PHA has a molecular weight that is about  
136 ten times greater than the molecular weight of the other PHA.

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138 41. The blend of claim 36, wherein one PHA has a molecular weight that is about  
139 six times greater than the molecular weight of the other PHA.

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141 42. The blend of claim 36, wherein one PHA has a molecular weight that is about  
142 three times greater than the molecular weight of the other PHA.

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144 43. The blend of claim 36, wherein one PHA has a molecular weight that is about  
145 the same as the molecular weight of the other PHA.

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147 44. The blend of claim 1, wherein the first PHA has a first glass transition  
148 temperature and the second PHA has a second glass transition temperature, wherein the  
149 difference between the first and second glass transition temperatures is at least about 1°C.

151           45.     The blend of claim 44, wherein the difference between the first and second  
152 glass transition temperatures is at least about 5°C.

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154           46.     The blend of claim 44, wherein the difference between the first and second  
155 glass transition temperatures is at least about 40°C.

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157           47.     The blend of claim 44, wherein the difference between the first and second  
158 glass transition temperatures is at least about 60°C.

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160           48.     The blend of claim 1, wherein the first PHA has a first melt temperature and  
161 the second PHA has a second melt temperature, wherein the difference between the first and  
162 second melt temperatures is at least about 10°C.

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164           49.     The blend of claim 48, wherein the difference between the first and second  
165 melt temperatures is at least about 50°C.

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167           50.     The blend of claim 1, wherein the first PHA is a homopolymer and the second  
168 PHA is a copolymer having at least three comonomers, wherein each of the comonomers are  
169 different from one another.

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171           51.     The blend of claim 50, wherein the first PHA is poly(3-hydroxybutyric acid)  
172 and the second PHA is poly(3-hydroxybutyrate-co-3-hydroxyvalerate-co-3-  
173 hydroxyhexanoate) or poly(3-hydroxybutyrate -co-3-hydroxyhexanoate-co-3-  
174 hydroxyoctanoate-co-3-hydroxydecanoate-co-3-hydroxydodecanoate-co-3-  
175 hydroxydodecenoate).

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177           52.     The blend of claim 1, wherein the first PHA has a first Hansen solubility  
178 parameter and the second PHA has a second Hansen solubility parameter, wherein the  
179 difference between the first and second Hansen solubility parameters is at least about 0.02  
180 J/mol.

182           53.     The blend of claim 52, wherein the difference between the first and second  
183 Hansen solubility parameters is at least about 0.04 J/mol.

185           54.     The blend of claim 52, wherein the difference between the first and second  
186 Hansen solubility parameters is at least about 0.05 J/mol.

188           55.     The blend of claim 52, wherein the difference between the first and second  
189 Hansen solubility parameters is at least about 0.10 J/mol.

191           56.     The blend of claim 1, wherein the blend is a miscible blend.

193           57.     The blend of claim 1, wherein the blend is an immiscible blend.

195           58.     The blend of claim 1, wherein the blend is a partially miscible blend.

197           59.     A blend comprising:

198                 a first PHA, and

199                 a second PHA, the second PHA being different from the first PHA and  
200 blended with the first PHA;

201                 wherein an amount of the first PHA in the blend is greater than an amount of  
202 the second PHA in the blend, a stiffness of the blend is less than a stiffness of the first  
203 PHA, and when the first PHA and the second PHA are blended, and the blend is  
204 molded the blend has a thermal deformation resistance temperature of at least about  
205 80°C.

207           60.     The blend of claim 59, wherein the blend exhibits a thermal deformation  
208 resistance temperature of at least about 85°C.

210           61.     The blend of claim 59, wherein the blend exhibits a thermal deformation  
211 resistance temperature of at least about 90°C.

213           62.     The blend of claim 59, wherein the blend exhibits a thermal deformation  
214 resistance temperature of at least about 100°C.

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216           62.     The blend of claim 59, wherein the blend exhibits a thermal deformation  
217 resistance temperature of at least about 120°C.

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219           63.     A blend comprising:

220                   a first PHA, and

221                   a second PHA, the second PHA being different from the first PHA and  
222 blended with the first PHA;

223                   wherein an amount of the first PHA in the blend is greater than an amount of  
224 the second PHA in the blend, a stiffness of the blend is less than a stiffness of the first  
225 PHA, and when the first PHA and the second PHA are blended, and the blend is  
226 molded, the blend has a thermal deformation resistance temperature of at least 80°C  
227 and a deformation angle tolerance of at least about 5°.

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229           64.     The blend of claim 1, wherein the blend has a first PHA copolymer having a  
230 comonomer 1-A and a comonomer 1-B blended with a second PHA copolymer having a  
231 comonomer 2-A and a comonomer 2-B.

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233           65.     The blend of claim 64, wherein comonomer 1-A and comonomer 2-A are the  
234 same comonomer.

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236           66.     The blend of claim 65, wherein comonomer 1-A and comonomer 2-A are both  
237 3-hydroxybutyrate.

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239           67.     The blend of claim 66, wherein each of comonomer 1-B and comonomer 2-B  
240 is, independently, 3-hydroxyvalerate, 4-hydroxybutyrate, 3-hydroxyhexanoate, 3-  
241 hydroxyoctanoate, 3-hydroxypropionate, 4-hydroxyvalerate, 6-hydroxyhexanoate, 3-  
242 hydroxydecanoate, 3-hydroxydodecanoate, or 3-hydroxydodecenoate.



244           68.     The blend of claim 67, wherein the first PHA copolymer has a first glass  
245 transition temperature, a first melt temperature, and a first Hansen solubility parameter, and  
246 the second PHA copolymer has a second glass transition temperature, a second melt  
247 temperature, and a second Hansen solubility parameter.

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249           69.     The blend of claim 68, wherein both the first glass transition temperature and  
250 the first melt temperature are greater than and more positive than the second glass transition  
251 temperature and the second melt temperature.

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253           70.     The blend of claim 69, wherein the blend exhibits a single glass transition  
254 temperature and a single melt temperature.

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256           71.     The blend of claim 70, wherein the difference between the first Hansen  
257 solubility parameter and the second Hansen solubility parameter is at most about 0.04 J/mol.

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259           72.     The blend of claim 70, wherein the difference between the first Hansen  
260 solubility parameter and the second Hansen solubility parameter is at least about 0.05 J/mol.

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262           73.     The blend of claim 70, wherein the glass transition temperature of the blend is  
263 substantially similar to the second glass transition temperature and the melt temperature of  
264 the blend is substantially similar to the first melt temperature.

265  
266           74.     The blend of claim 66, wherein the blend has a stiffness of at most about 250  
267 Mpa.

268  
269           75.     The blend of claim 64, wherein the first PHA has a first molecular weight and  
270 the second PHA has a second molecular weight, wherein the first molecular weight is from  
271 about 10,000 Daltons to about 1,600,000 Daltons and second molecular weight is from about  
272 10,000 Daltons to about 1,600,000 Daltons.

274           76.     The blend of claim 75, wherein one PHA has a molecular weight that is at  
275 most about 200,000 Daltons, and the other PHA has molecular weight that is at most about  
276 1,000,000 Daltons.

277  
278           77.     The blend of claim 64, wherein one PHA copolymer has a molecular weight  
279 that is at most about 200,000 Daltons, and the other PHA copolymer has molecular weight  
280 that is at most about 1,000,000 Daltons.

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282           78.     The blend of claim 64, wherein comonomer 1-A and comonomer 2-A are the  
283 same comonomer and the first PHA copolymer contains at most about 15 percent by weight  
284 of comonomer 1-B and the second PHA copolymer contains at most about 50 percent of  
285 comonomer 2-B.

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287           79.     An article comprising at least about 1 percent by weight of the PHA blend of  
288 claim 1.

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290           80.     A adhesive blend comprising:  
291                   a first PHA, and  
292                   a second PHA, the second PHA being different from the first PHA and  
293 blended with the first PHA;  
294                   wherein an amount of the first PHA in the blend is greater than an amount of  
295 the second PHA in the blend, a stiffness of the blend is less than a stiffness of the first  
296 PHA,  
297                   the adhesive blend having a surface tack time value of at most about 15  
298 seconds,  
299                   wherein, when exposed to a pressure of at most about 100 psig, the adhesive  
300 blend can form a bond with a surface or itself, the bond having a peel bond strength  
301 of at least about 10 Nm<sup>-2</sup>.

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303           81.     The blend of claim 1, further comprising an additive selected from a starch,  
304 thermoplastic starch, a polybutylene succinate, a synthetic biodegradable resins, a polylactic  
305 acid, a polyglycolic acid celulosic materials, a plant fiber, or a polyolefin.

306  
307           82.     A blend comprising:

308                 a first PHA, and

309                 a second PHA, the second PHA being different from the first PHA, wherein  
310 the second PHA is a copolymer having at least three comonomers, wherein each of  
311 the comonomers is different from one another;

312                 wherein an amount of the first PHA in the blend is greater than an amount of  
313 the second PHA in the blend, a stiffness of the blend is less than a stiffness of the first  
314 PHA and when the first PHA and the second PHA are blended, and the blend is  
315 molded, the blend has a deformation angle tolerance of at least about 5°.